

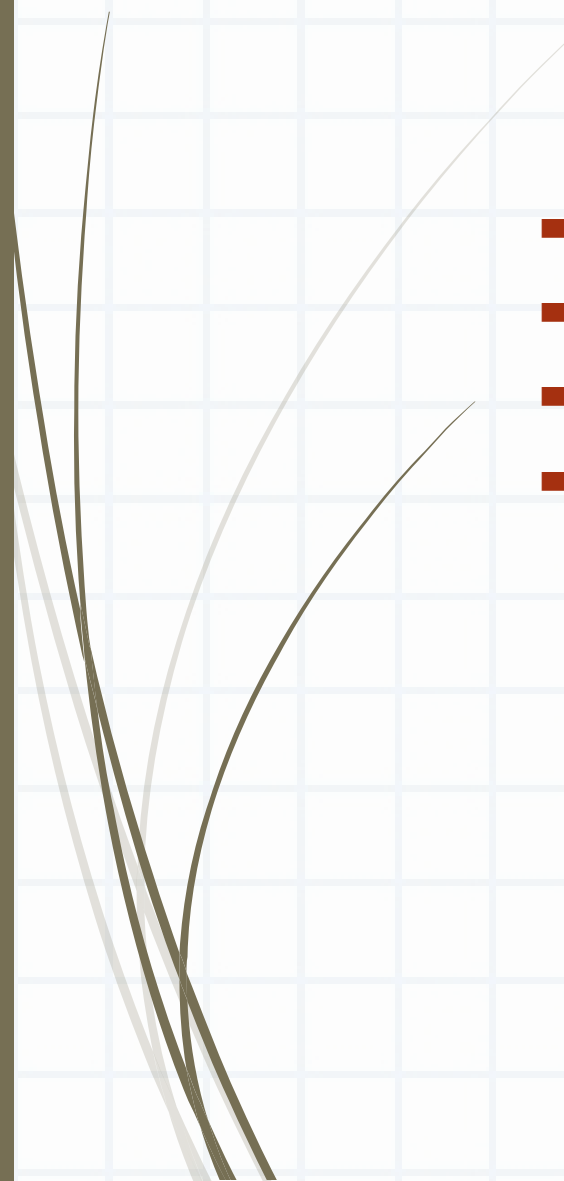


Precalculus Algebra









Section 3.2: Domain and Range



What we will cover:

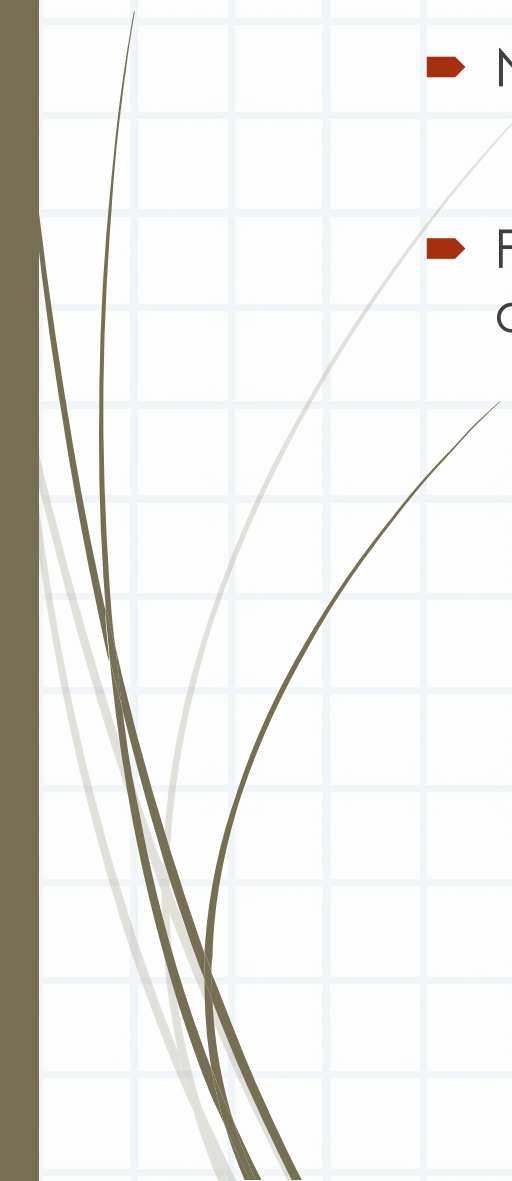
- 
- Interval notation
 - Determine domain of a function
 - Determine domain and range from graph
 - Piecewise function

Interval Notation

Inequality	Interval Notation	Graph on Number Line	Description
$x > a$	(a, ∞)		x is greater than a
$x < a$	$(-\infty, a)$		x is less than a
$x \geq a$	$[a, \infty)$		x is greater than or equal to a
$x \leq a$	$(-\infty, a]$		x is less than or equal to a
$a < x < b$	(a, b)		x is strictly between a and b
$a \leq x < b$	$[a, b)$		x is between a and b , to include a
$a < x \leq b$	$(a, b]$		x is between a and b , to include b
$a \leq x \leq b$	$[a, b]$		x is between a and b , to include a and b



Two Main Rules

- Never divide by zero
 - For real valued functions, do not take the square root or even root of a negative number
 - We will mostly be concerned with real valued functions unless stated otherwise.
 - It is safe to assume that the input to functions are real numbers, unless stated otherwise.
- 

Finding Domain

- 1) If no restrictions are implied, start with the set of all real numbers i.e. $(-\infty, \infty)$ (you typically see implied restrictions in applied problems)
- 2) if necessary, exclude input values from the set of real numbers that may result in division by zero
- 3) if necessary, for radicals with even index keep only input values that result in a zero (be careful) or positive radicand.
- 4) The resulting interval is the domain of the function.

Note: The idea is to determine only the input values that lead to definite real outputs.

Domain

- Determine the domain of $h(x) = 2\sqrt{x+4}$

Domain

- Determine the domain of the function $g(x) = \frac{5x+2}{x^2-1}$

Domain

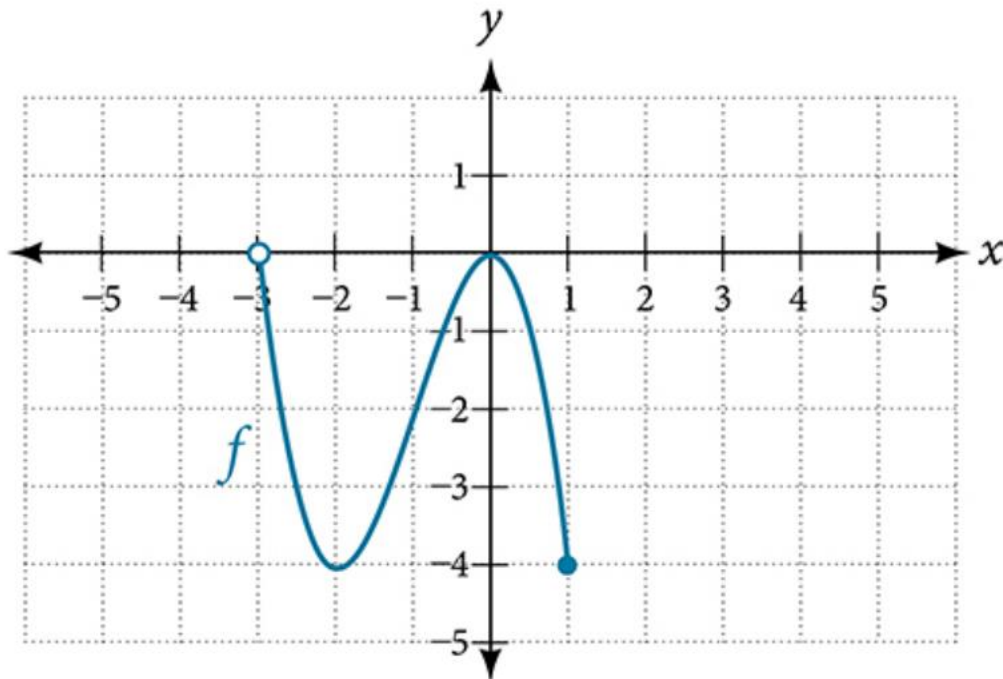
- Determine the domain of the function $h(x) = \frac{2x + 1}{\sqrt{5 - x}}$

Domain

- ▶ Determine the domain of the function $p(x) = x^2 + 2$

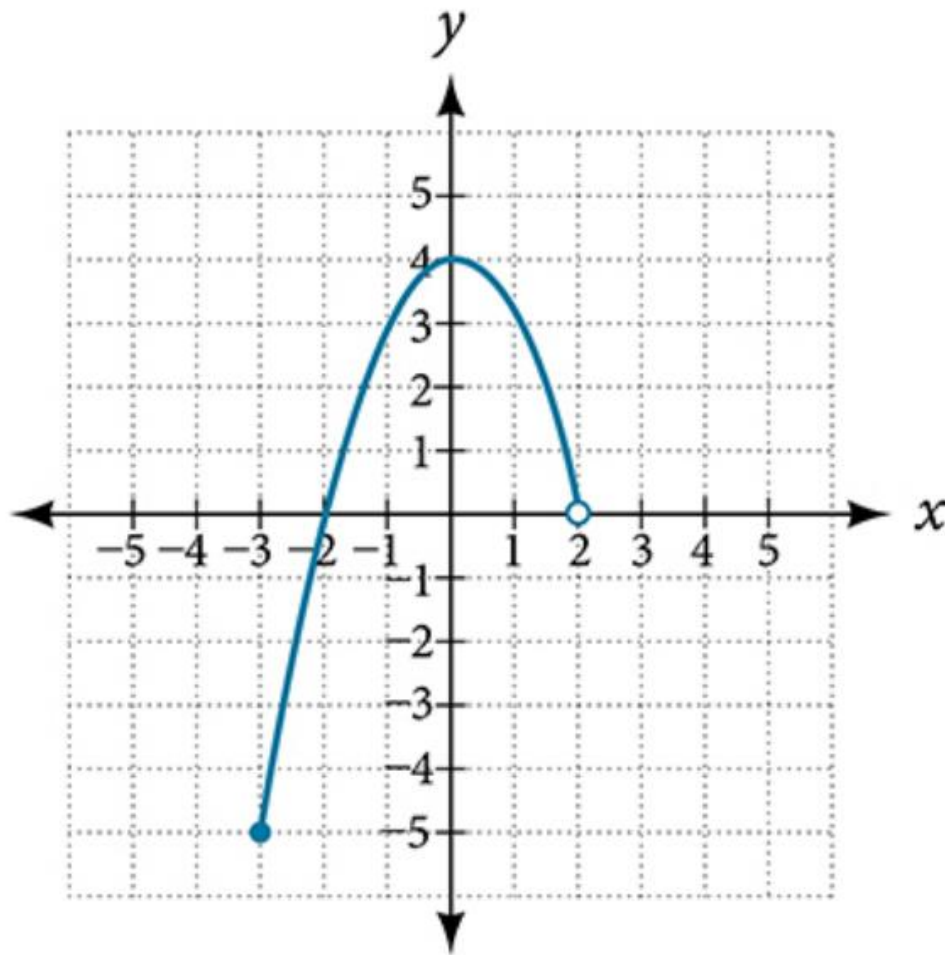
Domain and Range

- ▶ The complete graph of a function can be used to determine
 - ▶ the function's range.
 - ▶ the function's domain
- ▶ Determine the domain and range of the function whose graph is shown below.

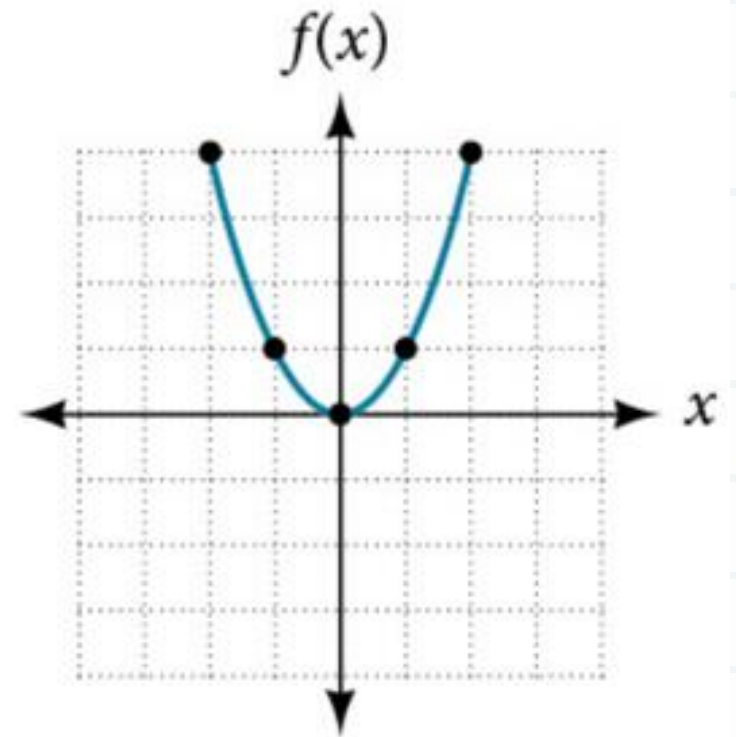
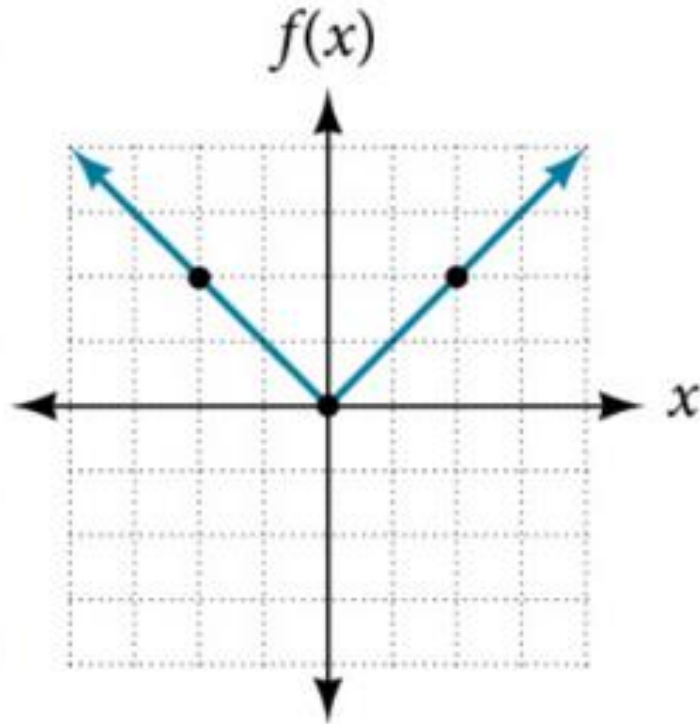


Domain and Range

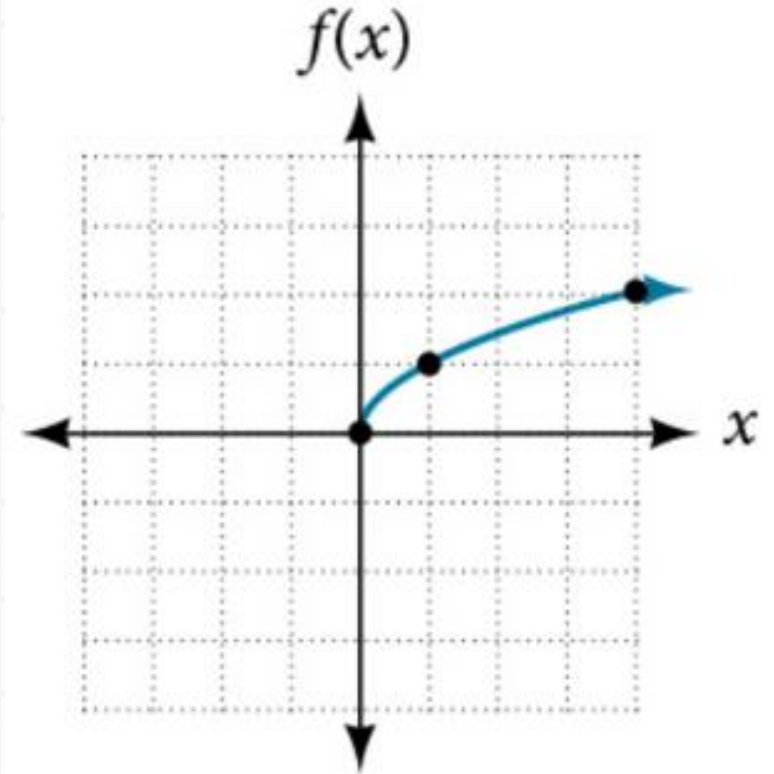
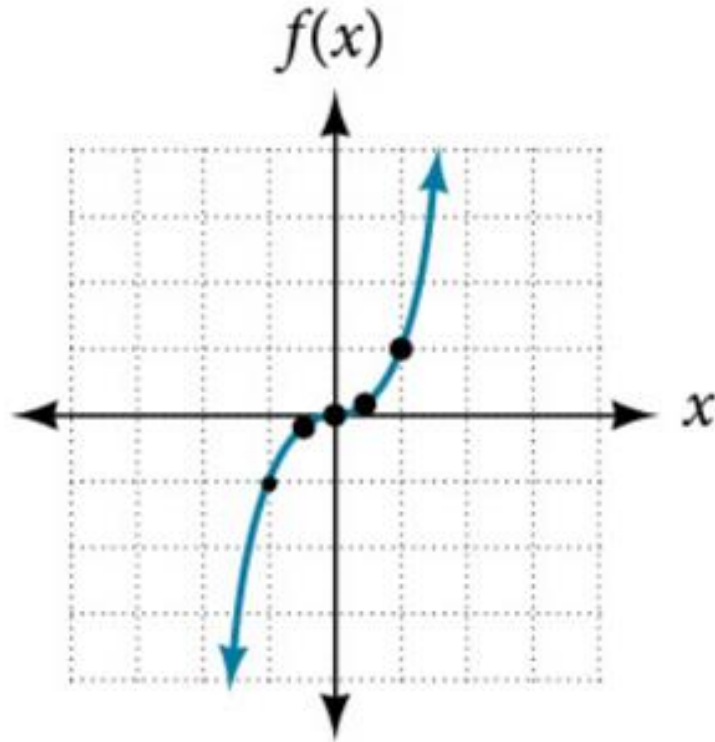
- Determine the domain and range of the function whose graph is shown below.



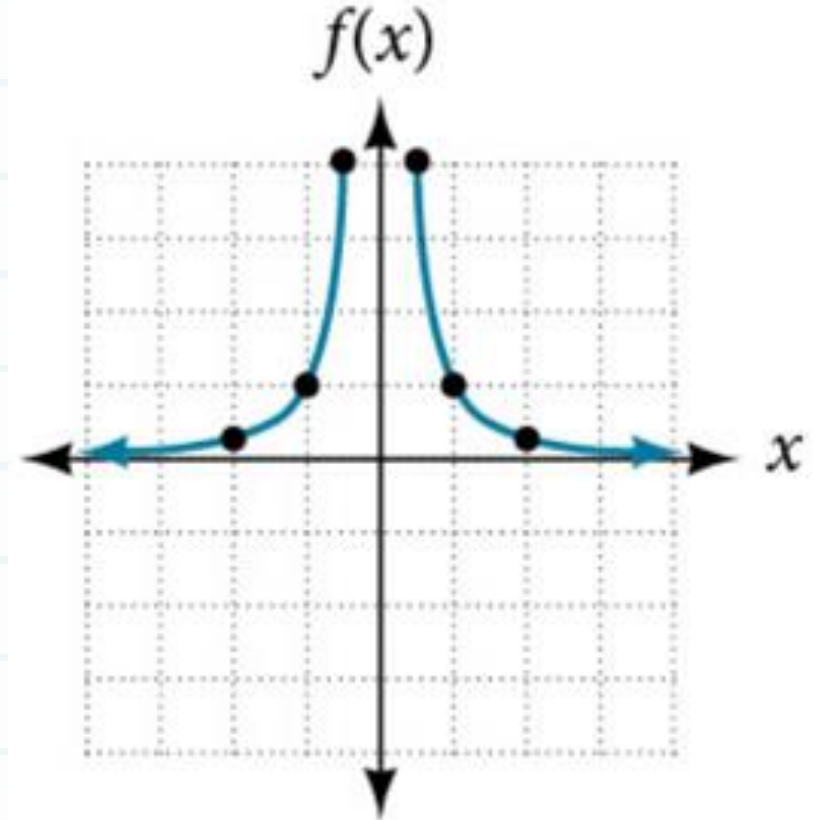
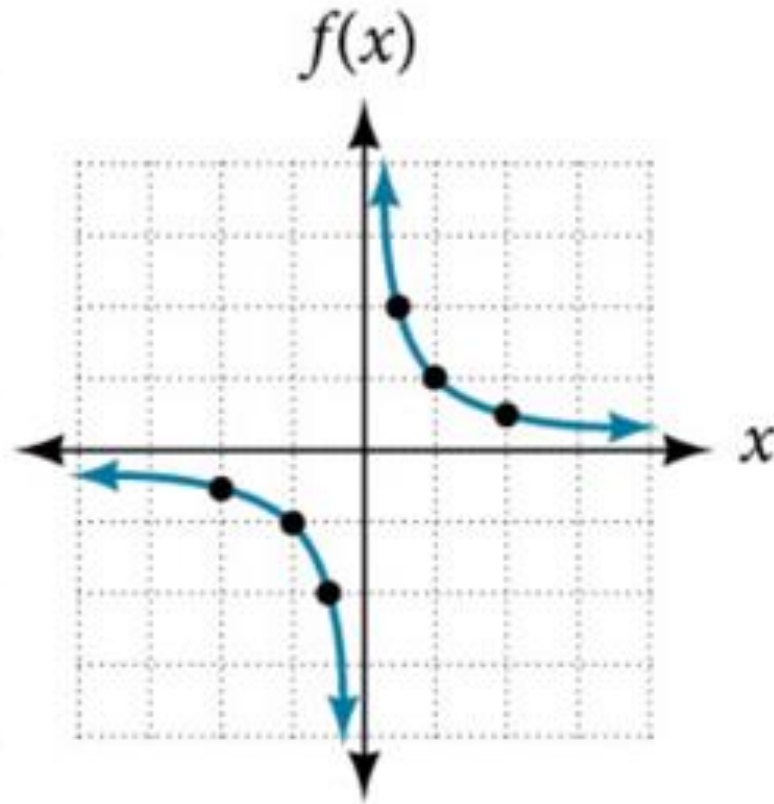
Domain and Range of common functions



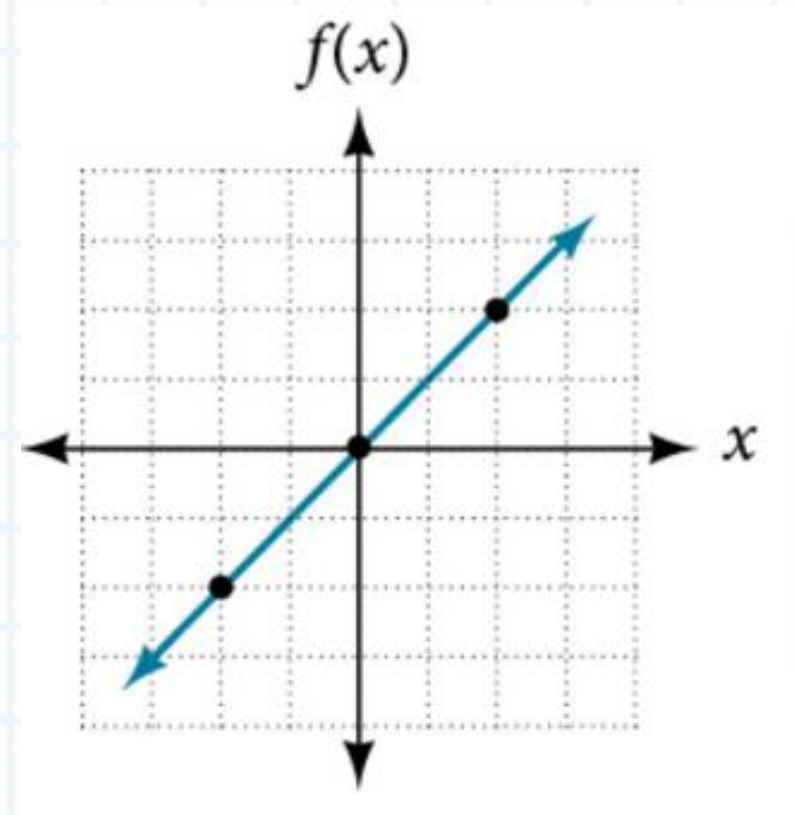
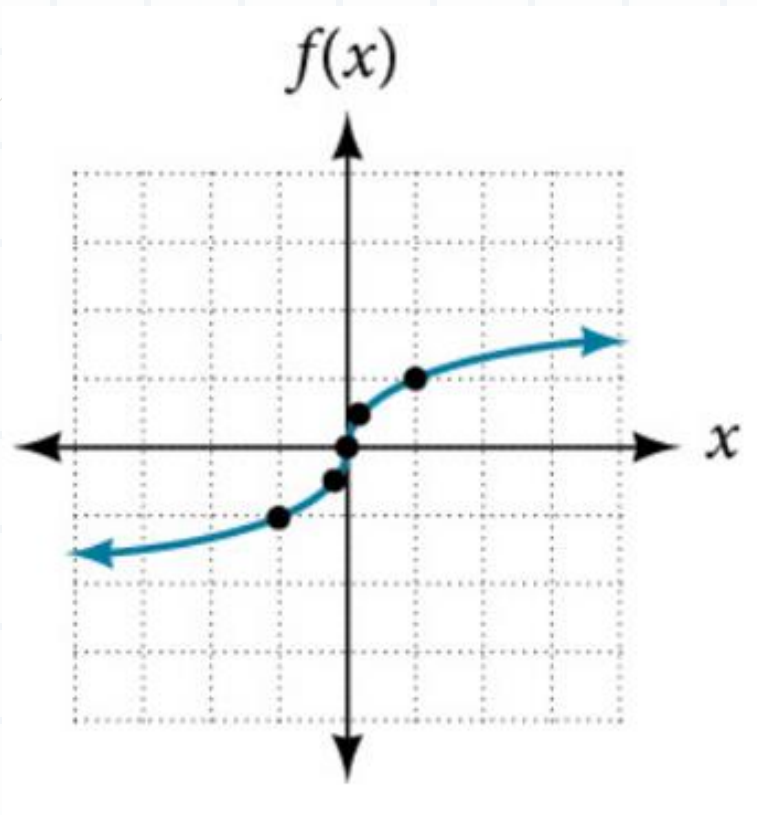
Domain and Range of common functions



Domain and Range of common functions



Domain and Range of common functions



Piecewise functions

Piecewise Function

A **piecewise function** is a function in which more than one formula is used to define the output. Each formula has its own domain, and the domain of the function is the union of all these smaller domains. We notate this idea like this:

$$f(x) = \begin{cases} \text{formula 1} & \text{if } x \text{ is in domain 1} \\ \text{formula 2} & \text{if } x \text{ is in domain 2} \\ \text{formula 3} & \text{if } x \text{ is in domain 3} \end{cases}$$

In piecewise notation, the absolute value function is

$$|x| = \begin{cases} x & \text{if } x \geq 0 \\ -x & \text{if } x < 0 \end{cases}$$

Piecewise Functions

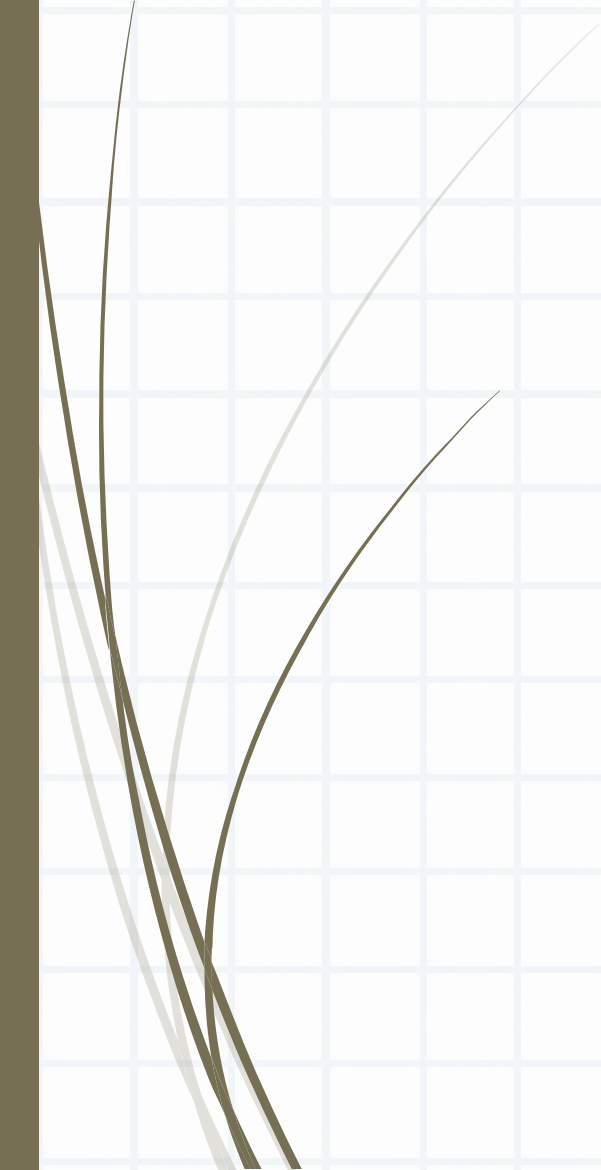
■ Given $f(x) = \begin{cases} 5x, & x < 0 \\ 3, & 0 \leq x \leq 3 \\ x^2, & x > 3 \end{cases}$

a) Evaluate $f(-1)$, $f(0)$, $f(2)$ and $f(4)$

b) Sketch a graph of f

c) Determine the domain and range of f

Continued





Homework Sec 3.2 due:

- See document on moodle for the problem numbers
- 